new process for sourdough bread improves uniformity and reduces process time

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SOURDOUGH bread, that robust flavorful cousin of French bread, has long been a favorite of tourists and residents of the San Francisco area. Over the years, an aura of mystery has shrouded the making of this bread. Purists have maintained that it could be made successfully only in the San Francisco area. In actuality this is not the case. Commercial bakeries have been reluctant to adapt to the 20 to 22 hour process, and to make additional capital investment for equipment, without the assurance of an awaiting market (*1*).

New Sourdough vs the Traditional

A new and simple procedure for making sourdough bread has been developed. This procedure is adaptable to any bakery, anywhere, equipped to make hearth breads or hard rolls. Essentially the method consists of adding lactic and acetic acids, the two acids identified in sourdough bread (*2*), to a French bread formula. Cottage cheese whey, a by-product of lactic fermentation from the making of cottage cheese, is used as the source of lactic acid. Vinegar is used as the source of acetic acid. The addition of these acids in the quantities and relative proportions found in traditional sourdough, eliminates the need for frequent sponge transfers and the long fermentation period.

This simple method produces a bread with the definite sour flavor, the resilient body, coarse texture, and crisp chewy crust characteristic of traditional sourdough in as little as fifteen per cent of the time. In addition, this bread has superior keeping qualities. Traditional sourdough and most hearth breads stale rapidly. This new sourdough retains its fresh quality up to three days.

Traditional sourdough breadmaking is dependent on microorganisms in the sponge to grow and produce lactic and acetic acids. Sponge transfers and lengthy proof times are necessary to obtain proper acid development and leavening power (*2*). Newly developed frozen starter cultures for sourdough bread have eliminated the need for sponge transfers, however, they still require the long proof time to develop acidity.

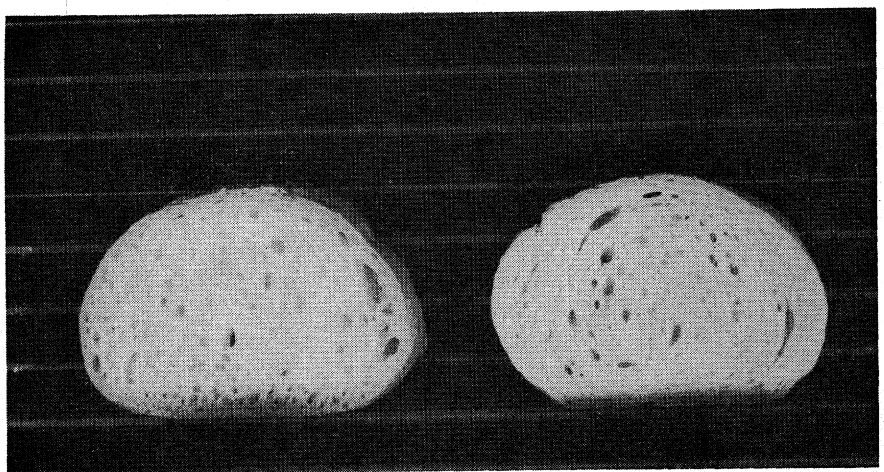
Essential steps in making traditional sourdough bread have been outlined by Kline (*2*) and his associates who have done considerable research in this area. The procedure described by them is as follows:

1. A continuous starter sponge is maintained by rebuilding it every eight hours, or three times per day. This continuous sponge is comprised of two parts (40% previous sponge, two parts (40%) high gluten flour, and one part (20%) water.

2. The developed sponge is used to make the dough which is comprised of:

20 parts starter sponge
100 parts flour
60 parts water
2 parts salt

3. The dough is allowed to relax for at least 30 minutes after make-up,



Traditional San Francisco sourdough bread, left, is virtually identical in grain, texture and taste to sourdough bread made by faster process using cottage cheese whey and vinegar, shown at right.

Sourdough Formulas and Make-up Procedures

Sponge and Dough Process Time Required: 6 hours

Ingredients	Parts by Weight Using CC Whey Powder	CC Whey Concentrate
Sponge		
Flour, high gluten	50.0	50.0
Yeast	2.5	2.5
Water	35.0	35.0
Malt (optional)	1.0	1.0
Dough		
Flour, high gluten	50.0	50.0
Salt	2.0	2.0
Shortening (optional)	1.0	1.0
Water	18.1	7.6
CC Whey Powder	10.5	–
CC Whey Concentrate, 50% solids	–	21.0
Vinegar, 50 grain	6.9	6.9

Dough temperature: 80 ± 1.0°F
Floor time: 30 min.
Intermediate proof: 15 min.
Final proof: 60 min. at 90 to 100°F
Slash surface with diagonal cuts, bake 45 min. at 375°F in steam hearth oven

Straight Dough Process Time Required: Less than 3 hours

Ingredients	Parts by Weight Using CC Whey Powder	CC Whey Concentrate
Flour, high gluten	100.0	100.0
Yeast	4.0	4.0
Water	53.1	42.6
Malt (optional)	1.0	1.0
Salt	1.5	1.5
Shortening (optional)	1.0	1.0
CC Whey Powder	10.5	–
CC Whey Concentrate, 50% solids	–	21.0
Vinegar, 50 grain	6.9	6.9

Dough temperature: 90 ± 1°F
Ferment: 40 min., 95 to 100°F
Floor time: 10 min.
Final proof: 60 min., 95 to 100°F
Slash surface with diagonal cuts, bake 45 min. at 375°F in a steam hearth oven.

Cottage cheese (CC) whey powder has been given high heat teatment, contains approximately 7.0% lactic acid. Cost is approximately 10 cents per pound of solids.

Cottage cheese (CC) whey concentrate has been heat treated to denature whey proteins and contains approximately 3.5% lactic acid. Cost is approximately 5 cents per pound of solids.

then it is scaled, rounded and given an intermediate proofing before moulding. The shaped loaf is given a 6 to 8 hour final proofing.

4. The fully proofed loaf is given several diagonal slashes, then it is baked in a hearth oven saturated with steam during the first half of baking. The bread is baked at 375 to 400°F for 45 to 50 minutes. A steam or "wet" oven is essential to achieve the desired crust characteristics.

Simplified Sourdough Procedure

This sourdough bread can be made using either a sponge or a straight dough procedure. The straight dough, which can be made in less than three hours, uses more yeast, less salt, and higher dough temperatures than the sponge method. Formulas and procedures for both methods are shown adjacent.

Formulas have been adjusted so that total acidity in the bread is equal to that measured in traditional sourdough. The proportions of lactic to acetic acid (Table I) are also similar to those found in traditional sourdough. Either the straight dough or sponge method can be used to make this bread with no discernible differences in flavor. The volumes tend to be slightly higher and the grain more open with the sponge method.

Table I. Comparison of the Characteristics of Simplified Sourdough vs Traditional Sourdough

Characteristics	Simplified	Traditional
Total acidity, meq/g bread	0.09 to 0.10	0.07 to 0.11
Acidity as acetic acid	38%	varies, 3 to 50% (2, 3)
Acidity as lactic acid	62%	varies, 50 to 97% (2, 3)
pH of bread	4.7	3.9 to 4.1
Specific volume of bread, cc/g	3.3 to 3.7	3.2 to 3.6
Time required in preparation	< 3 to 6 hours	20 to 22 hours

Advantages of the Simplified Method

In addition to shortening the length of the bread making procedure this simplified method offers several other distinct advantages over traditional sourdough. Using cottage cheese whey and vinegar assures more uniformity in the acidity of the finished product. A level of acidity which suits local taste preferences can be maintained through the addition of more or less cottage cheese whey and/or vinegar. Ratios of lactic to acetic acid also can be adjusted to suit market preferences. Such flexibility is not possible following traditional sourdough methods of sponge propagation. The traditional method is subject to considerable product variation which can be due to changes in the sponge itself and/or plant conditions at various times of baking.

The use of cottage cheese whey offers additional advantages. Cottage cheese whey improves the nutritive value of the bread by supplying a source of protein, lactose and minerals. Whey also functions as a buffer keeping the pH of the bread at 4.7. While the total acidity, or quantity of acid, in the simplified sourdough bread can be maintained at a level equal to that found in traditional sourdough, the buffering effect of the whey maintains the higher pH. The higher pH is an advantage because it enables bakers' yeast to grow efficiently in the system, thus eliminating the need for a special acid tolerant yeast. The use of bakers' yeast also accounts for the rapid fermentation.

Using Cottage Cheese Whey

Sourdough bread can be made using either a liquid cottage cheese whey concentrate or dried cottage cheese whey. The whey must be heated sufficiently to denature whey proteins prior to concentration and/or drying.

Using a liquid blend requires only that water added to the bread formula be adjusted to allow for moisture in the blend. A liquid whey concentrate containing fifty per cent total solids can be prepared easily in a whey processing plant, and is more economical to use than the dried form. Cost per pound of whey solids increases as more water is removed. In terms of the bread formula, based on one hundred pounds of flour, the cost of whey solids added ranges from $1.05 for 10.5 pounds as whey powder to $0.53 for 21.0 pounds as a fifty per cent solids concentrate.

Another advantage of using the liquid whey concentrate is that it can be blended with the vinegar and packaged in production batch sizes. Batch sizes could be specified by the bakery depending on their requirements. Storage of the liquid blend is not a problem. The high acid content of the blend makes it resistant to spoilage, and it can be stored for several months at room temperature. Some separation of the liquid and solid portions does occur during storage, but mechanical agitation serves to recombine the solids.

Sweet whey, readily available in the dried form from many dairy suppliers, cannot be used in place of cottage cheese whey. Sourdough bread made with sweet whey lacks the characteristic sourdough flavor since sweet whey contains much less lactic acid than cottage cheese whey.

Implications of the New Process

Development of this sourdough procedure offers promise to the baking industry. Now, bakery product marketers can expand a high-priced, regionally popular bread into a national item using existing equipment and shop conditions. The concept of producing sourdough type baked products using whey-vinegar blend need not be limited to fully-baked bread. Brown-and-serve bread and rolls, or frozen dough are additional possibilities for this sourdough process. Items such as fully-baked sourdough rolls, biscuits and muffins represent simple line extensions to sourdough bread.

Consumer acceptance of this new sourdough is widespread. Consumer sampling throughout the Northeast has indicated that the bread is well received and that its appeal is not limited to the Pacific Coast area. Some of the positive attributes of the bread which were cited by consumers include the appealing sour flavor, the body and textural qualities of the bread, and the crisp chewy crust. Since the bread is made from wholesome natural ingredients, without artificial additives, it also should have good market potential for the growing numbers of nutrition conscious consumers.

By using cottage cheese whey and vinegar blends all the existing barriers previously hindering the making of good sourdough bread are overcome. Now authentic tasting sourdough can be enjoyed everywhere from San Francisco to Maine. ō

References

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